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FOREWORD

The Plant Disease Reporter inaugurates its nineteenth volume with the present issue. Each year in addition to publishing the Reporter and preparing crop loss estimates the Plant Disease Survey issues an annual summary of the plant disease occurrences reported during the year.

The Survey also maintains at the Washington headquarters a conveniently accessible permanent card catalogue of the reported occurrences of plant diseases in the United States, and two rather extensive, though not complete, catalogues of plant disease literature, one arranged alphabetically by hosts and the other by parasites. Those to whom these records are of potential value are always welcome to make free use of them, as that is the purpose for which they are maintained.

H. A. Edson.

NOTES ON THE EFFECT OF THE 1934 HIGH TEMPERATURES AND DROUGHT ON THE FRUIT CROP OF THE OZARKS SECTION OF MISSOURI AND ARKANSAS

John C. Dunegan and M. A. Smith

(Cooperative work between the Bureau of Plant Industry and the Arkansas and Missouri Agricultural Experiment Stations).

With maximum temperatures reaching 95°F. the end of May and continuing almost unabated until August 20, including some days when temperatures of 104°-105° and even 107°F. were recorded in the Ozarks, and with only 2.21 inches of rainfall from June 16 to August 20, the 1934 growing season presented an unusual set of environmental conditions. The figures cited above are those recorded at Fayetteville, Arkansas, but comparable temperature and rainfall readings were recorded throughout the entire Ozark region of Missouri and Arkansas.

It is axiomatic that these severe environmental conditions should affect the growth and behavior of vegetation and these notes are an attempt to evaluate some of the effects of the drought and heat on the apple, peach, and cherry orchards.

The effects observed on the apple orchards will be discussed first and for the purpose of this discussion may be divided into three groups: (1) the effect on the prevalence of fruit diseases; (2) the effect on the size and quality of the commercial fruit crop; and finally (3) the effect of the continued drought on the life of the trees.

The Effect of the Drought on the Prevalence of Apple Diseases

Apple scab (Venturia inaequalis). - The environmental conditions in March, April and the first part of May were about average and ascospores of the apple scab fungus, Venturia inaequalis, were observed in spore traps in the orchards at Fayetteville, Arkansas, on April 4, 9, 10, 15, 16, 17, 26 and May 9 and the first scab lesions on the leaves were noted on May 4. As the result of these conditions favoring initial scab infection, the disease developed to an alarming extent in a few orchards which were either neglected or were improperly sprayed. In apple orchards given the proper early sprays only an occasional scab lesion developed on the leaves and fruit. It is clear that the high temperatures and the lack of moisture reduced apple scab to a negligible factor in these orchards as secondary infections, which frequently develop in May and June during seasons of normal rainfall, did not occur in 1934.

In the experimental plots at Marionville, Missouri, apple scab perithecia were late in maturing in the spring of 1934. Only 30 per cent contained mature ascospores on April 1. By May 1, 65 per cent contained mature ascospores. Ascosporic discharges occurred on April 22, 27,

May 4, 6, 15 and 22. The first scab lesions on non-sprayed foliage were noted on May 2 and on non-sprayed fruit on May 11. Foliage infection in the non-sprayed plots at Marionville in 1934 was the lightest seen in a number of years. During the latter part of May there was some evidence of secondary scab infections on foliage but with the advent of abnormally high temperatures, in early June, further spread of scab was abruptly checked.

It appeared that apple fruits were in a stage more susceptible to infection than were leaves during the period when major ascosporic discharges occurred. Counts of non-sprayed drop apples during the first week in June showed 50 per cent of them to be infected with scab. In the remaining plots which received the regular fungicidal sprays and in properly sprayed commercial orchards, scab was found only occasionally on the leaves and fruit.

Apple blotch (Phyllosticta solitaria). - The prevalence of the apple blotch fungus (Phyllosticta solitaria) was markedly influenced by the drought. Normally it appears in northwest Arkansas late in May or early in June as a disease of both the fruit and foliage. This year leaf and fruit lesions were practically non-existent in commercial orchards, an effect that is nearly attributable to the absence of favorable infection periods.

In the Marionville, Missouri, area the apple blotch disease is seldom the problem that it is in the orchards of northwest Arkansas, and this year leaf and fruit infections were seen only rarely and the disease was of no commercial importance.

Spray injury and leaf spot diseases. - The absence of scab lesions on the foliage resulted in less injury from various sprays. In many years sprays, particularly lime sulphur solution, cause the death of extensive areas of leaf tissue in the vicinity of scab lesions. This type of injury and spots caused by the black rot fungus (Physalospora obtusa) were practically absent in 1934 with the result that lesions caused by secondary fungi (Alternaria mali, Coniothyrium spp. and others) which invade and slowly enlarge spray injury and black rot spots were decidedly less common than usual.

While the killing of leaf tissue, adjacent to fungus lesions, by lime sulphur sprays was not common in 1934, nevertheless the use of lime sulphur and other sulphur spray compounds caused considerable injury both in Arkansas and Missouri as the result of the high temperatures. This type of sulphur injury, better described as "sulphur shock", was prevalent in many orchards. The injury involved scorching of the margins of the leaves, the killing of areas in the leaf blades and the retardation of the growth of the leaves. Many growers both in Arkansas and Missouri changed from sulphur to copper sprays in May when the high temperature developed, but in spite of this precaution many cases of severe sulphur injury to the foliage resulted. This injury was first observed in June and

continued to be manifested even into July. It was obvious from these results that the sprays containing sulphur which were applied in mid-May were the ones responsible for the burning which showed up in June. Not enough rain fell during this time to remove any appreciable amount of sulphur and as a result it was carried on the foliage which was seriously burned later. That this injury was due to the sulphur content of the sprays was clearly indicated by the condition of trees in experimental plots at Fayetteville, Arkansas, and Marionville, Missouri, where trees sprayed with copper phosphate from the beginning of the season showed a higher degree of vigor, less foliage burning and larger leaves than did the trees in the experimental plots which received applications of lime sulphur.

Sulphur injury to the fruit accompanied the sulphur injury on the foliage observed in many orchards and sun burning or scalding of apples exposed to direct rays of the sun was observed frequently. However, drought spot (i.e. the development of large, firm, corky areas in the flesh) was not observed.

For the past three seasons many orchardists in Missouri and Arkansas have incorporated spray oils in their insect control program. As is well recognized, the use of spray oils in conjunction with sulphur-containing sprays in the summer is unsafe because of the danger of foliage and fruit burn. A number of typical examples of injury were observed due to the application of a spray oil to foliage which had previously been sprayed with liquid lime sulphur. In several instances, orchardists who had used sulphur sprays early in the season delayed the application of oil as long as possible in order to minimize the danger of spray injury. Even after observing this precaution, spray injury resulted and the conditions mentioned earlier, i.e., lack of rainfall and foliage which carried an unusually heavy spray residue, were the chief factors which brought about this result.

As the result of the lack of scab and blotch infection many growers in northwest Arkansas omitted the fungicides and used only arsenate of lead in their cover sprays. In the past seasons this procedure has been accompanied by considerable risk of the development of arsenical injury, but this year the injury did not develop in the various orchards. It is very probable that the lack of rain was largely responsible for this effect as experimental work and observations in the past have demonstrated that arsenical injury to fruit develops only in those seasons when rainfall is at least normal.

The Effect of the High Temperatures and Drought on the Size and Quality of the Apple Crop

The different varieties of apples reacted differently as would be expected, to the high temperatures and drought, but the general statement can be made that the size of the crop and the size and quality of the individual apples was materially reduced this season. Perhaps the variety which suffered the most in northwest Arkansas was the Stayman Winesap. The

fruit of this variety has the reputation of cracking when growth is resumed following a check during the growing season from the lack of rain. The behavior this year certainly justified this reputation. In the experimental plots at Fayetteville 27,335 apples or 62 per cent of a total of 43,857 examined apples were found to be cracked and unmerchantable. Furthermore 38,787 apples or 88 per cent of the total number of apples dropped before harvest time. The Stayman Winesap trees used in the experiment were 14 years old. This extreme cracking and dropping of the fruit was a common feature in the younger Stayman Winesap orchards throughout the district, but in the older orchards (20 years or more) the fruit did not crack so extensively. The Stayman Winesap crop harvested in northwest Arkansas came almost entirely from these older orchards.

The early maturing apples such as Yellow Transparent and Maiden Blush were affected by the drought primarily in regard to size attained by the individual apples although in certain locations many of these apples dropped badly. At Springdale, Arkansas, for example, one grower estimated that he had a 3,000 bushel crop of Yellow Transparent apples at the beginning of the season but by the time the apples reached a diameter of 1-1/2 inches the majority fell to the ground and less than 100 bushels were harvested. The size of Maiden Blush apples likewise was seriously affected, as may be illustrated by the statement of one grower who counted 490 apples in one bushel selected at random in his packing shed. Furthermore, the Maiden Blush crop as a whole failed to develop any color.

Stayman Winesap has been discussed. After this variety was harvested the remaining varieties showed less effect of the drought as rains in August and September helped to improve their quality. However, the Jonathan variety showed considerable cracking and was generally of inferior size. The Delicious variety in most orchards was of fair quality and size with only a trace of cracking. Collins Red and King David showed some cracking and even Ben Davis cracked in some orchards.

The drought, therefore, can be said to have had a pronounced effect both on the size of the crop and on the size and quality of the individual apples. The extent of the injury varied with the variety, age of trees, and with various orchards but counterbalancing this reduction in size and quality was the increase in price obtained for fruit in 1934. In some cases the culls in 1934 brought better prices than the No. 1 fruit in 1933.

The Effect of the High Temperature and Drought on the Life of the Apple Trees

Observations made in the Ozark section of Missouri showed that hundreds of apple trees died and it was noticeable that the loss of trees of the Ben Davis variety was much greater than that of any other variety. In this section there are many orchards of Ben Davis from 25 to 35 years old. While a record of the trees of this entire section is not available, figures on 26 scattered orchards showed them all to be infected with Illinois blister

canker (Nummularia discreta) in varying degrees of severity during the past season. As would be expected, these diseased trees were the first to show the effects of the water shortage. In one orchard 16 blister canker infected trees were dead by July 15. In an examination of trees made on August 10, dead or dying Ben Davis trees could be found in any orchard containing that variety. Other varieties such as Winesap, Delicious, Jonathan, York, and King David certainly showed signs of suffering from lack of water but a large percentage of them managed to come through the season alive.

Similar statements can be made for the apple orchards in the Arkansas Ozarks. The extreme drought further accentuated by the high temperatures, was undoubtedly the cause of the death of these trees this year. It must be remembered, however, that many of the older apple trees in Missouri and Arkansas are still suffering from the low temperatures of January, 1930, which caused widespread injury in the form of crotch and body cankers. The early death of many of these trees was clearly indicated as the result of the low temperature injury in 1930, but the 1934 drought accentuated the mortality rate of these injured trees.

The Effect of the Drought on the Peach Crop and on Peach Diseases

In 1934 the peach industry in Arkansas considered itself fortunate in escaping the usual spring frosts which in the past few years have materially reduced the size of the crop. It was estimated before the drought started that the State would ship at least 3,000 cars of peaches. It is difficult to obtain accurate figures due to the fact that much of the peach crop was shipped by auto truck, but it is doubtful if more than the equivalent of 1,500 cars of fruit were actually shipped this season. This reduction in size of the crop is the direct result of the drought as the fruit failed to develop normal size. In addition to being small in size, the fruit did not develop normal color and as a whole the crop was inferior.

Some blossom blight (Sclerotinia fructicola) occurred early in the spring and some of the early raturing varieties developed fruit rot but brown rot was of no importance as a disease of the bulk of the crop.

The rains of March, April, and early May were sufficient in quantity and duration to establish primary bacterial spot (Bacterium pruni) infections on the leaves and fruit. Subsequent development was influenced by the drought and the disease, while present on the fruit, did little damage, nor did it cause widespread premature defoliation of the trees.

Peach scab (Cladosporium carpophilum) was as usual of no importance in orchards sprayed at the proper time.

One peach grower at Springdale, Arkansas, attempted, with considerable success, to circumvent the drought by a rough system of irrigation. The

orchard consists of 827 eight-year-old trees and approximately 3,000 bushels of Elberta peaches were harvested this season. One million gallons of water were applied during the drought at a cost of $240. The fruit ripened one week later than the fruit in adjacent orchards and was superior in size and color. The grower obtained from $1.50 to $1.85 per bushel for the fruit while the price prevailing at Springdale, Arkansas, was $1.00 a bushel with some fruit bringing as much as $1.50 a bushel.

The Effect of the Drought on Cherries

The early maturing cherries were not seriously affected by drought and produced a good crop. The varieties Montmorency and Early Richmond generally bore good foliage and the trees were in a good vigorous condition throughout the summer. The variety English Morello did not stand up so well. One grower near Exeter, Missouri, irrigated his trees in an effort to save both the crop and the trees. In spite of this the fruits were of small size, many were shriveled, and he stated that at harvest nearly 50 per cent of the crop was lost because of the drought.

BOTRYTIS RHIZOME ROT OF IRIS IN MINNESOTA IN 1934

Louise Dosdall

A rhizome rot of iris caused by Botrytis convoluta Whetzel and Drayton was found for the first time in Minnesota in the spring of 1934. (Reporter 18:103, July 15, 1934). The first diseased plant was brought in March 21 by one of the principal iris growers in the State. This plant was one of the first uncovered, but the grower reported that he had observed the rot for a number of years and that it apparently developed only while the plants were covered during the winter. As far as he was able to determine all of the plants were perfectly healthy when covered in the fall, but when uncovered in the spring some of them were killed by the rot. After the plants began growing in the spring there seemed to be no further signs of the disease, and plants that were not killed recovered and seemed to be all right. On April 3 the same grower brought in more material with quanitities of characteristic sclerotia. Botrytis convoluta was isolated from the tissue of the rhizomes and from the sclerotia.

A systematic search was started for the disease, and it was found in all the iris plantings visited. These included two large nurseries, a planting in the Horticultural Garden at University Farm consisting of about 1,000 iris plants, a planting of several thousand irises in one of the city parks, and an amateur grower's garden with several hundred plants. All of these plantings are in or around St. Paul.

The winter of 1933-1934 was an unusually hard one on perennials of all types and especially on iris. Because of this fact, it was necessary

to examine each individual plant to determine whether it had been frozen out or whether the Botrytis was present. Consequently, the survey was rather limited in extent. In the plantings examined the disease was just as severe among plants which had been covered as among those which had not been covered during the winter. There did not seem to be any difference in the severity of the disease between plants which had been divided and transplanted one, two, three, or more years previously. In some cases every plant in a row was killed, in others only an occasional plant. In some of the beds four years or more old most of the plants were killed by the fungus, and the striking thing about them was the enormous quantities of sclerotia formed on the diseased plants.

After the middle of May iris plants were growing rapidly, and it was no longer possible to detect the presence of the disease. The plants at University Farm were watched carefully during the summer. Early in August sclerotia were collected from the soil and germinated on agar. In September several hundred plants on which the fungus had been found in the spring were dug and the roots cut up. No sclerotia or characteristic rot could be detected by which the grower might recognize the disease at this stage. By painstaking search sclerotia could be found in the surrounding soil. Early in October, however, the outer leaves of many of the plants were drying from the tips. The same symptoms had been observed during the entire summer but had been caused by soft rot bacteria, borer infestation, and possibly other agents. The botrytis disease, however, can be distinguished by the fact that the leaves are firmly attached to the rhizome and at the base have the dry, pithy, gray rot characteristic of the rhizomes infected in the spring. When these leaves were placed in a moist chamber quantities of conidia developed all over the surface in a few days. The fungus was also isolated from the tissue of infected leaves.

The writer found the fungus on the following varieties of iris between the period of March 21 and May 11, 1934:

Aksarben
Aliquippa
Alfheim
Amber
Auburn
Autumn Glow
Autumn Queen
Barton Harrington
Boy Blue
Brandywine
Cardinal
Chartier
Colias
Commodore
Coppersmith
Daphne
Dusky Maid
Emir
Esplendido
Flammenschwert
Fuerstin Lonyay
Glamour
Golden Promise
Grousman Red
Havamal
Helene Koehler
Hyperion
Iduna
Joshua
Lady Chas. Allom
L'Aiglon
L. A. Williamson
Lord Lambourne
Lustre
Mme. Cheri
Magnifica
Marocain
Mary Barnett
Mary Tinley
Memory
Mireille
Mrs. Cuthbertson
Olympus
Orange Queen
Parc de Nieully
Peau Rouge
Pendragon
P. L. Battey
Prince Lohengrin
Red Riding Hood
Rugajo
Taj Mahal
Tenebrae
Tidbit
True Charm
Valincia
Yvonne Pelletier

The grower who brought in the first specimen reports that according to his records the disease has appeared on the following varieties within the last few years:

Alabaster	Ember	Mlle. Schwartz	Rose Madder
Alvarado	Forsette	Mother of Pearl	Rotarara
Apache	Gandvick	Mystic	Ruth Pfeiffer
Arzani	Gold Imperial	Nancy Orne	Seminole
Athene	Guileless	Oberon	Silver Mist
Ballerine	Imperator	Palemon	Snowhite
Bluett	Jacinto	Polaris	Swazi
Chalice	Jacq. Guillot	Princess Beatrice	Sweet Lavender
Chasseur	Kalos	Prospero	Thorsten
Citronella	Karen	Queen Caterina	Trostringer
Daphne	King Karl	Rajput	Valery Mayet
Dreamlight	Mildred Presby	Rheintraube	Wedgewood

THE SUGAR-BEET NEMATODE, HETERODERA SCHACHTII, SCHMIDT, ON OATS IN CANADA

On July 25, 1934, a collection of oat roots heavily infested with Heterodera schachtii were received from Mr. D. F. Putnam of the Ontario Research Foundation, Toronto, Canada. Mr. Putnam reported that "It is a severe seedling disease of spring cereals in Ontario." This constitutes the first record of H. schachtii as infesting oats in America, although it is frequently reported as a serious parasite in Europe.

Comparison with Heterodera punctata Thorne, which attacks wheat in Saskatchewan, Canada, showed that the two were very distinctly different. (Gerald Thorne).

DIPLODIA MACROSPORA ON CORN IN BRAZIL

Helen Johann

A rot of corn caused by Diplodia macrospora Earle has been reported from Alabama, North Carolina, Florida and the Gold Coast, Africa. In addition, the writer in 1929 obtained D. macrospora from corn kernels harvested in South Carolina and Louisiana.

A report from Brazil indicates that this disease is present in South America also. In August, 1929, rotted kernels of an unnamed variety of white corn from the crop of the previous season, which subsequent platings showed to be infected with D. macrospora, were received from the South American division of the Corn Products Refining Company of New York, accompanied by the information that the disease was reported as new by Brazilian farmers and corn dealers, having been recognized by them for the first time the preceding season. The Brazilian manager of the company reported at that

time that the disease had been discovered only in the State of Sao Paulo.

In culture the fungus differs from Diplodia zeae chiefly in the larger size of its spores. At ordinary laboratory temperatures the mycelium of D. macrospora grows less rapidly on potato dextrose or oat meal agar than does that of D. zeae and on these agars pycnidia of D. macrospora are formed more slowly and much less abundantly.